DOCUMENT RESUME

ED 360 182 SE 053 566

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TITLE Scientist and Teacher Partnerships in Elementary Schools.
PUB DATE Apr 93
NOTE 42p.; Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (Atlanta, GA, April, 1993).
PUB TYPE Reports - Descriptive (141) -- Speeches/Conference Papers (150) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Community Involvement; Educational Change; Elementary Education; *Elementary School Science; Elementary School Teachers; *Partnerships in Education; *School Business Relationship; *Science Instruction; Science Teachers; *Volunteers

ABSTRACT

This paper describes the development of a partnership project in New Castle County, Delaware, which teams scientists and other technical specialists with elementary teachers to enrich science activities in the teachers' classrooms. Interest in the project has evolved from a small, structured pilot program with 12 volunteers to a wide ranging project with approximately 150 volunteers in 14 schools. Activities of the volunteers include teaching of single classes or units and serving as resources outside the classroom. Problems encountered include not enough volunteers, teachers not utilizing the volunteers for help, poor communication among program participants, and incomplete record keeping about the program. Appendixes provide examples of partnership activities, evaluation forms, and a chart listing project challenges and the solutions found so far. (Contains 15 references.) (PR)

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SCIENTIST AND TEACHER PARTNERSHIPS IN ELEMENTARY SCHOOLS

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Paper presented at the annual meeting of the National Association for Research in Science Teaching, Atlanta, GA, April, 1993

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SCIENTIST AND TEACHER PARTNERSHIPS IN ELEMENTARY SCHOOLS

The purpose of this paper is to describe the development of a partnership project which teams scientists, and others with technical backgrounds, with elementary teachers to enrich science activities in the teachers' classrooms. Due to the results of evaluation and to growing interest in the project, it has evolved from a small, structured pilot project with 12 volunteers to a wide ranging undertaking with approximately 150 volunteers. [This paper reports on the partnerships in New Castle County only. In the state's other two counties, partnerships have just begun in three schools.]

SIGNIFICANCE

In the United States there has been a call from various sources, such as private industry (e.g. McBrayer, 1989), the federal government, and non-profit organizations (e.g. the Triangle Coalition (Fowler, 1989)) and Education Commission of the States (Newman, 1990) for alliances among the education, industry, and business communities. Such alliances would provide opportunities for these organizations to pool their resources to improve science education. In 1988 such an alliance, the Science Alliance, was established in Delaware. Since then this coalition of industry, business, and education has been working to enhance precollege science education in the state. In first years the DuPont Company provided funding and many of the scientist volunteers. Now the Science Alliance data base contains approximately 500 volunteers, with over 140 organizations providing volunteer, financial or in kind support.

The Science Alliance Board of Directors decided to focus the initial efforts of the Alliance on the elementary school. The Board members decided on this direction for two reasons. First, they felt it was important to expose young children to quality science teaching so they would not loose interest in science in the elementary years. Second, they knew of the many obstacles elementary teachers encounter in teaching science well (see, for

example, Johns, 1984; Schoenberger & Russell, 1986; Tilgner, 1990; Weiss, 1987; Wier, 1988). These obstacles include elementary teachers' lack of confidence in teaching science which is exacerbated by a lack of support for them in terms of materials and equipment, time to plan and teach science, and personnel to provide support in science teaching.

The Science Alliance hoped that they could lend support to elementary teachers in overcoming some of the obstacles they encounter through partnerships with scientists. A major program of the Science Alliance has been the development of these partnerships, with the goal of combining the scientists' technical expertise with the teachers' classroom expertise to enrich children's experiences in science.

This paper will describe the partnership project and how it has been revised based on the evaluation of the pilot project and subsequent experiences. Throughout, there will be a focus on difficulties, "challenges," encountered in establishing partnerships and solutions found or tried. In addition, preliminary work on evaluation of the effect of the partnerships on the students -- their perceptions of scientists -- will be described. The paper will follow this outline:

- a brief history of the project including the rationale for changes based on evaluation
- an overview of the present program, including problems encountered and work toward solutions
- description of preliminary work on evaluating the changes in students' perceptions of scientists

APPENDIX

- examples of partnership activities
- evaluation forms
- listing of "partnership project challenges" we have encountered along with some of the solutions, and a call for advice and suggestions.

HISTORY, DESIGN, AND PROCEDURES

Pilot Project

During the 1989-90 school year, partnership pilot project was conducted with 20 fourth, fifth, and sixth grade teachers from 12 schools. All received training in the use of one of three SAVI/SELPH units and were given the materials to teach the unit. Twelve teachers (the experimental group) were then paired with scientists to co-teach the unit. The others (the control group) taught the unit on their own.

Using several evaluation procedures, we determined that the participants' response to the partnerships was very positive (Wier, 1991). For example, the teachers and scientists reported that the training, the equipment, their partners' support in teaching, and the equipment were helpful and appropriate. They also appreciated the assistance from the Science Alliance in setting up partnerships. However, some indicated more guidance was needed in determining the participants' responsibilities. In addition, some reported that finding a time to plan with partners was a problem. Many of the scientists were anxious to develop longer term relationships with classes and schools. However, a follow-up evaluation showed that only one of the partnerships continued into the next year. Furthermore, that one probably continued because the scientist's child attended the school where she participated in the partnership project. The scientist reported that contact was made with the teacher in the second year when she "ran into" the teacher when at the school for a parent conference.

Other Efforts

In addition to the pilot project, other types of efforts for developing teacher/volunteer partnerships were tried. One type was a series of workshops on specific elementary science topics attended by both teachers and volunteers. Although the workshops were highly rated by the participants, to our knowledge no partnerships were developed from them.

Another type of experience was more successful. In one school, with help from a supportive principal, several teachers worked with five volunteers from a chemical company in the area (Imperial Chemicals Inc., ICI). These partnerships lasted throughout the year, with a volunteer working at each grade level. (Due to redistricting and changes in school staffing the next year, the staff at this school was dispersed and the partnership program was not established in that building.)

A partnership-related activity, "breakfast with a scientist," was developed at a primary school. The school includes an Intensive Learning Center with physically and mentally handicapped young children. Because the special challenges of teaching these children were sometimes difficult for volunteers, the lead science teacher set up the "breakfast" program to stimulate interest in science among the staff. A science interest sheet is posted in the school inviting teachers and other staff members to list science related topics they would like to know more about. Each month someone with a specialty in one of the topics is invited to join the staff members for breakfast (provided by the staff) and share his or her work informally. Topics have included information about the geologic survey, plastics, water conservation, aerospace, beekeeping, and muscular problems (related to some of the children's handicaps). The format has proved a comfortable way for the staff members to expand their knowledge and meet scientists and others with technical backgrounds.

The experiences described above led the coordinators of the partnership project, the Science Alliance Elementary Committee, to the conclusion that long range partnerships were more likely to develop in schools where a number of teachers were interested in working with scientist partners. Furthermore, we had learned that it was necessary to organize the partnerships directly. They would not just happen because teachers and scientists attended a workshop session or meeting together.

1991-2 School Year: a heady start

To initiate the next phase of the partnership project, a survey was distributed to all elementary schools in New Castle County (the most populous of Delaware's three counties) to determine schools where a number of teachers were interested in partnerships. When responses were in, we selected schools across the five school districts and parochial and private schools where four or more teachers expressed an interest, for a total of 14. Next project was announced to the over 200 volunteers on the Science Alliance data base. The project was described and scientists were asked to respond and to indicate which schools or locations would be best for them. In the first year, 48 volunteers worked with teachers in 14 schools throughout the county. In addition, toward the end of the school year a group of volunteers from a joint venture pharmaceutical company, DuPont Merck, made plans to "adopt" another large elementary school with the help of the Science Alliance.

At this point, in about February of 1992, it was clear that this was too large a project to be coordinated by volunteers only. The Science Alliance Board of Directors agreed to provide funding for the New Castle County Volunteer Coordinator, Melanie Vinson, to add hours to her parttime position to take over the coordination of the program.

A procedure for establishing the partnerships in the fourteen schools was developed by the Elementary Committee. A coordinator from the committee worked with the principal and teacher liaison at each school to set up an initial meeting with teachers and volunteers assigned to the schools. The coordinators facilitated the teacher/scientist meeting, making sure that matches were made by interest and/or grade level. Concurrently, the Elementary Committee developed and conducted orientation "training" sessions for the volunteers. The sessions included (1) a very brief overview of the Science Alliance and its programs, (2) an introduction to current research in science education, including a videotape excerpt of a classroom where conceptual

change/constructivist strategies were employed, (3) an American Chemical Society video tape "Chemist in the Classroom," (4) a sample lesson conducted by an experienced volunteer which included an activities on "who can be a scientist" and "what scientists do" (the cycle of observations, ideas and experiments), and (5) discussion on different ways partnerships could be established and implemented. Volunteers were expected to attend an orientation session before working in the classroom.

The partnerships took different forms. Sometimes, to get started, scientists developed "get acquainted" sessions -- presentations or displays, consisting of activities to introduce themselves or show what scientists do and who they might be. The scientists were often paired by grade level and they helped develop activities which fit with the curriculum. Others worked with teachers across grade levels developing activities on a certain area of interest. In addition to helping develop lessons, the scientists often provided the equipment needed. In some cases, due to technical difficulties, the partnerships were started too late in the year to establish a pattern of participation.

To keep track of the partnership activities, coordinators visited the schools and/or made telephone calls to the teachers and volunteers. In addition, the teachers, scientists, and students were asked to complete evaluation forms giving their opinions of the project organization and effectiveness of participation and suggestions for improvement. All responding teachers indicated that they would like to continue the partnerships in the next year. They were, in general, pleased with the scientists' participation and some hoped that the program could begin earlier in the next year. Although most teachers and scientists indicated that initial meetings went well, a few felt that the time it took for the teachers and volunteers to team up and start planning could be shortened. All responding scientists were willing to be involved again, but a few were taking on additional responsibilities at

work and could not remain involved. All scientists rated the orientation training session as "good" or "excellent." Some were not sure whether the goal of the partnership had been reached because it had not been determined in their particular partnership.

Summer Preparations

Based on the written and informal feedback, the Elementary Committee planned for the next school year by conducting a summer workshop in which partnership packets were compiled for the teachers and volunteers. The packets were based on one developed by a coordinator (who was also the liaison teacher) who had very good success at establishing partnerships in her school. They contained information such as partnership activity suggestions, safety tips, school curriculum guidelines, a list of available equipment, and evaluation forms.

The Elementary Committee also met with the liaison teachers from each school to go over the packets, discuss how to get started at the beginning of the school year, and share successful partnership experiences. In order to start all the partnerships earlier in the school year, the coordinators and liaison teachers planned teacher and volunteer meetings for September or October. The Elementary Committee had determined that schools would not be a part of the partnership program unless the building principal supported the project. Letters were sent to each principal where partnerships had taken place explaining the program and asking her or him to sign a form stating support and identifying a liaison teacher. The partnerships were again monitored by the coordinators and the participants were requested to complete written formative and summative evaluation forms.

1992-3 School Year: some glitches appear

Although we had made every effort to get the partnerships started early in the school year, difficulties were encountered in several schools. The primary problem was a shortage of volunteers. The principal reason for this shortage was the weak

economy which caused many of the industries to "downsize." For this reason many of the volunteers were having to take on additional responsibilities at work and were thus unable to spend so much time in, if any, classrooms. Others (two we know of) had determined that working in elementary classrooms was not their cup of tea. Therefore, we were short of volunteers in all but two of the 14 schools.

We tried a variety of recruitment approaches. They included: letters to current volunteers asking them to recruit colleagues, e-mail messages to those on the Science Alliance lists at DuPont and ICI, press releases to local newspapers, and notices in professional newsletters and the Science Alliance newsletter. (In the future posters recruiting volunteers for various Science Alliance projects will be placed in about 75 locations, including industries, colleges, and the Academy of Life Long Learning, a "college" for retirees).

A few volunteers trickled in but there were still not enough in schools. The Science Alliance volunteer coordinator proposed a method that had been used in a school the year before. That was to send a letter home to parents in the partnership schools to ask those with technical backgrounds to become partners in their children's schools (they were assured that they would not be asked to do anything else for the Science Alliance unless they wished to). Parent letters were sent home at five schools. There were responses from parents at all schools, ranging from a low (but appreciated!) three at one school to a high of 14 at a school where many parents are University of Delaware employees. At orientation/training sessions set up for these volunteers, the school coordinator and/or liaison teacher met with the volunteers to set up the contacts with the teachers.

Another problem appeared in some schools. In these schools teachers were not calling on the volunteers to help. For example, in one school where there were not enough volunteers to start in the fall a system of matching teachers and volunteers had not been established. When the parent letter brought in 14 volunteers

in January, the school partnership coordinator and lone volunteer from the fall (also a parent), wrote a memo with a calendar attached asking the teachers who were interested in volunteer help to indicate the unit topics and the type of help they needed (co-planning and teaching, co-teaching, resource only) on the calendar. The responses to this helped the coordinator pair up volunteers with teachers once volunteers had attended an orientation session. In some of the schools, it appeared that the teachers were so busy with demands of a number of different programs that they simply did not have time to deal with planning with scientist volunteers.

On-going Challenges

Communication among coordinators, teachers, and volunteers remains a problem. In schools where there is an enthusiastic liaison teacher who also has time to check up on what was going on in partnerships, communication and development of the total program, for that matter, is easier. However, contact with teachers remains difficult because they have little access to phones during the school day. This makes it difficult for the teachers and volunteers to contact each other about planning and for the coordinator to determine what is going on at a school. Most telephone contacts, therefore, have to be made in the evening. Coordinators sometimes make trips to the school to contact teachers directly.

Keeping records about the program is also been a challenge. Each coordinator is supposed to check up on his or her school before the monthly Elementary Committee meeting, but because most of the coordinators have full time jobs it is often difficult for them to make contacts with everyone involved at their schools and turn in their reports. "Event reports" are included in each volunteer and teacher packet to be submitted after each volunteer works in a classroom. But very few volunteers and teachers complete reports and submit them regularly. Therefore, the record of what is going on in each partnership is incomplete.

Evaluation

Evaluation of this project is much more difficult than that of the pilot project. There are many more participants involved in a wide variety of activities and funding to hire someone to help with the evaluation is not available. We try to keep up with what is going on in the partnerships and generally how well it is going through contacts by the coordinators, asking teachers and volunteers to complete "event reports," and pre and post assessment forms. But the communication problems described above and the difficulty of collecting forms from all participants has made gathering evaluation information a problem.

As far as assessing what the students' gained from the partnerships we decided that the common thread across the activities we could try to assess was the children's perceptions of scientists. We hoped that through their contacts with the scientists and other volunteers the children would become aware of (1) the range of careers dependent on skills in science, math, and technology and (2) that these careers are accessible to women and men and to all races.

Children's Images of Scientists We decided to use an assessment that included asking children to draw pictures of scientists before the partnerships began and then again at the end of the year. Previous studies by Flick (1990) indicated that a scientist-in-residence program improved elementary children's image of scientists as measured by the Draw-A-Scientist Test (DAST), an assessment developed by Chambers (1983) based on Mead and Metraux's work (1957).

Preliminary Work Preliminary work on assessing the goal of the partnership project to expand children's perceptions of scientists and science related careers began informally in one of the early partnerships. The year before our "formal" assessment was developed the scientist partners of the second grade teachers in one partnership school made a special effort to increase the children's awareness of the accessibility of science

careers to all types of people. The second graders were asked to draw a picture of a scientist and write questions they would like to ask scientists. All of the drawings which were gender identifiable depicted white males, most in lab coats or working in labs. These results were similar to the findings in a number of previous studies (e.g. Chambers, 1983; Flick, 1990, Maoldomhnaigh & Mhaolain, 1990; Schibeci & Sorensen, 1983) where white males with various stereotyped characteristics dominated children's drawings.

The scientist partners for this second grade, two women (one caucasian, one Asian) from a pharmaceutical company, made a videotape of their colleagues in their work places. On the tape the scientists -- men and women, white and African-American -- explained how they became interested in science, what they did in their work, and answered the children's questions, including personal ones (e.g. do you like pizza?). In addition to showing the videotape to the children, the scientist partners conducted five different activities with the classes.

A follow-up on the children's images of scientists was conducted at the beginning of the next school year. As third graders, they moved to a new school along with children from "non-partnership" primary school. A sample of third grade classes was asked to draw pictures of scientists. (We chose to ask for scientists to avoid the pitfalls of drawing the "public stereotype" pointed out by Symington & Spurling (1990)).

The results, similar to those found by Flick (1990) showed that children exposed to men and women scientists drew pictures of both genders. In addition, girls were more likely to draw female scientists. In this study, 77% of the girls from the partnership school and 17% of the boys drew females. Surprisingly, however, 75% girls from the non-partnership school also drew female scientists. None of the boys from that school drew female scientists. We found that children from the non-partnership school were from an residential area where many parents were employed in scientific/technical fields, possibly

accounting for the high percentage of female scientist drawings. Despite the surprising results from the non-partnership school, we were pleased to see that post drawings from the partnership school indicated that contact with the scientists made a difference in the children's, especially the girls, perceptions about women as scientists.

Current Work This year we have made an effort to measure changes in children's perceptions of scientists by including a pre/post questionnaire with each teacher packet (see form in appendix). The children are asked to explain what scientists do, what they think the most important part of science is, if they are a scientist, and what kind of people use science. They are then asked to draw pictures of scientists.

The challenges we have encountered in this evaluation process include: (1) a lack of control over how the assessment is administered, (2) inability to collect the assessments from all classrooms, and (3) for the youngest children, lack of skills to express themselves in writing or drawing (for example, their drawings are often unidentifiable as to gender and/or race). Ideally we would follow-up by interviewing the young children to find out what they think and whom they drew, but coordinators have not had the time to do this.

SUMMARY AND CONCLUSIONS

Despite the problems/challenges, by March 1993 there were partnerships to some degree in 14 schools (with three more in the lower two counties and several more schools on the "waiting list"). Approximately 150 volunteers, from a low of one volunteer working with two teachers (in math) at one school to a high of over forty volunteers working with numerous teachers in the DuPont Merck/Warner Elementary School partnership. Teaching activities range from actual co-teaching of units to single presentations by the volunteer. In addition a few of the volunteers serve as resources outside the classroom, as in the

example of the Science Discovery Room in one school, and the volunteer who became the "equipment guru" at a school. [Examples of partnership activities are provided in the appendix.]

Progress had been made in solving some problems. For example, recruiting parents was a break through and we will begin this early in the school year next year. Communication among volunteers and teachers we hope will be improved by having enough recruits at the beginning of the year so that meetings for the volunteers and teachers can take place early and planning can be done for the year. Communication between teachers and volunteers and coordinators may be improved by involving more people as coordinators. Ideal situations have been those in which the liaison teacher is an enthusiastic science-oriented teacher who works closely with the coordinator or actually <u>is</u> the coordinator and attends committee meetings. Evaluation of the program is a huge task with many facets. We ask for written evaluation forms, but as we know from the past it is difficult to get a response from everyone involved. Contacting each participant directly may be impossible, but with the coordinators' help we will try to contact most teachers and volunteers to gather information for evaluation. The problems of assessing what the children gain from the experience have been discussed above. Ideally, we should have a knowledgeable person in charge of evaluation who would collect all forms, interview participants, observe partnerships in action, analyze the data and report the results. This would be a full time job requiring outside funding. Grant writing also takes time not available at this time.

POST SCRIPTS

Resource Center A project related to the partnerships began this year -- the establishment of a science, math, and technology resource center to be used initially by the partnership participants needing materials and equipment. Funding

received from two local foundations ($36,500) was supplemented by Eisenhower funds from the five school districts in New Castle County to set up the center and provide training. A task force is working on this project, hoping to open the center in September 1993.

The Author Officially, I am Assistant to the Dean, College of Education, University of Delaware. I have been involved with the Science Alliance since its inception, focusing my attention on elementary teachers and partnerships. As a member of the Science Alliance Board of Directors, I serve as liaison (sometimes co-chair and secretary as well) to the Elementary Committee. I also serve as coordinator for one of the partnership schools, giving me first hand experiences with the "challenges" of the project.

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APPENDIX

EXAMPLES OF PARTNERSHIP ACTIVITIES

APPENDIX

EXAMPLES OF PARTNERSHIP ACTIVITIES

Getting Started Activities

Occasionally two or three volunteers working together developed programs to introduce themselves to the classes with whom they would be working. The primary goal was to make children aware of the type of people scientists can be (any gender, any race, and variety of appearances). These presentations seemed to have grown from the activity demonstrated by the scientist volunteer in the orientation session. Examples of these activities include the video introducing scientists in their place of work described above. Another example is an assembly developed by three scientists from Gore Associates for one elementary school. They presented themselves as "a biker," "a nerd" and a woman. After the children selected the male "nerd" as the scientist, they revealed that they were all scientists. To demonstrate what a scientist might do at work, they set up a demonstration on propulsion, using balloons attached by straws to fishing lines strung across the gym. To cheers from the audience, they tested the students' hypotheses about which balloons would move faster and farther and discussed the results.

Co-teaching/partnerships examples

One volunteer/parent, a chemistry professor, assisted a second grade teacher in implementing a program developed by a local Presidential Award winner (P.A.S.S.). The volunteer, sometimes with the help of her college honors students, helped to make materials to be used by the children, helped monitor the children during the hands-on part of the lesson, and developed some supplementary activities which expanded the lesson concept.

Many of the other teaching partnerships seemed to be less co-teaching and more volunteer planning and teaching with input from the teacher. For example, an agricultural engineering professor developed and taught, with the help of the teacher, lessons in which the eighth grade students used surveying

equipment to gather data to make a topographical map. Another volunteer supplemented a fifth grade unit on astronomy by setting up a telescope for student use after he discussed and showed a video on the planets. Another volunteer helped with a second grade unit on the moon by setting up a demonstration on moon phases. This same volunteer set up activities so that students could make weather equipment during a weather unit. Another volunteer helped develop and teach lessons on trees to supplement a unit on fall in primary grades.

Some volunteers were invited for "one shot" presentations. For example, one scientist provided materials and activities to explain, in very simple terms, plastics and polymers to several classes. Another, demonstrated research on chicken eggs and discussed with the children why some of the eggs they tried to hatch in their classrooms did not hatch.

Partners "Outside the Classroom"

"Please Touch Table" grows to "Discovery Room"

At one primary school, the volunteers help set up displays and a Science Discovery Room but do not actually work with the directly with the students. In the first year three volunteers and the science oriented liaison teacher set up an interactive display in the school lobby. The children were invited to observe, try out ideas, and experiment, using balances, plastic beakers, and other safe equipment. They were also invited to try on lab coats and safety glasses and look into a mirror labeled "This is what a scientist looks like."

The next year the activities were moved to an empty classroom and set up as centers. Every class in the K-3 school can now visit the "Science Discovery Room." Parents have been trained to guide the children, especially to listen to them, as they work at the centers. The volunteers along with the liaison teacher change the theme every couple months. The themes thus far have been the scientific method, classifying, and magnets. The volunteers report that teachers at the school are now offering

ideas for centers.

Equipment Coordinator

In a different type of partnership one volunteer became the equipment "guru" of her partnership school. She searched the closets, nooks, and crannies to find existing science materials. When she discovered that the school had several FOSS modules but that they needed more equipment to implement the module with a whole class, she wrote a grant proposal and obtained additional materials. At the suggestion of the Elementary Committee coordinator, the volunteer set up an Open House one day at the school so that teachers and volunteers could come by and see the FOSS materials and participate in demonstrations on the activities. The volunteer then sent out an evaluation form asking teachers what they thought about the open house, what materials and resources they still needed, and if they didn't come, how come? (if it was science phobia she offered to talk with them about it). She also included a list of all materials and where to find them in the school and a list of the volunteers. Concurrently, this same volunteer is helping teachers develop a unit on the "ocean" which they will teach to students who cannot go on an extended field trip to the shore

ADOPT-A-SCHOOL PROGRAM

Adopt-a-School: "It's Like a Second Home"

DuPont Merck, a joint venture pharmaceutical company based Wilmington, Delaware, wanted to "adopt" a local school and assist in enriching the science program. At first, personnel from the company's human resources/public affairs department thought that volunteers could help establish and run science fairs. An associate scientist, Letitia (Tish) Cheatham, who had been active in organizing volunteer projects was asked to help develop an adopt-a-school program. Tish reported that those involved took over a year to decide on the type of school (elementary or high school); the program (something the volunteers could do year round, not just at Science Fair time); and what organization they

could ask for organizational assistance (the Science Alliance or other groups involved in fostering science/engineering, etc. careers).

They chose the elementary school level for two reasons. First, they wanted to work at the early grade levels to try to foster children's interest in science and, second, they wished to counter misinformation students might receive about the use of animals in research. They liked the Science Alliance's emphasis on partnerships and decided to focus on that with the help of the Alliance. Teachers at a large elementary school, Warner Elementary (grades 3-5), about 10 minutes drive from the company headquarters, expressed an interest in working with DuPont Merck. An assistant principal and teacher active in science became the contact people at the school. DuPont Merck representatives met with the school staff to brainstorm ideas for the partnership. The decided to work on the following: co-teaching, mentoring, breakfast with a scientist, and an assembly program "Let's Visit a Research Lab."

The next step was recruitment of volunteers. With the support of a vice president in Research and Development, a committee was established to begin planning for the partnership. Dissemination of the partnership proposal began at a meeting of interested DuPont Merck employees. The approximately 100 who attended were then contacted by electronic mail and asked to communicate with a organization committee member if interested in participating in one of the programs. During the summer, those who volunteered attended one of two volunteer orientation sessions conducted by the Science Alliance Elementary Committee for DuPont Merck. Approximately fifty volunteers participated in the Warner programs in the first year.

Meanwhile, because the Warner teachers had expressed an interest in what went on at DuPont Merck, they were invited to the laboratories for one-half day tours during the summer. Thirty teachers took advantage of the tours. They were greeted by the director of development, viewed demonstrations of research

projects, and toured the animal facilities. Over lunch they brainstormed partnership ideas with the volunteers.

Getting Started In the fall, the partnership started with an assembly. After the film "Why I Should Stay Awake in Science Class" was shown, about a dozen of the DuPont Merck volunteers "introduced" themselves by appearing in outfits that illustrated their interests outside the lab. For example, there was a scuba diver, a basketball player holding onto an "invisible dog" leash and collar (she also trained dogs), a hiker, and probably the most dramatic -- one volunteer arrived on his roller blades.

Co-teaching A few weeks into the year, seventeen teachers were paired with DuPont Merck volunteers. The pairing was primarily one to one, however, two volunteers were paired with more than one teacher. The teams developed co-teaching units which would fit the teachers class. Some examples include:

- lessons on magnets
- six sessions on microscopes led by a volunteer. The students began by examining the microscope and worked up to making their own slides. The children were coached on proper record keeping techniques.
- a biostatistican helped fourth graders explore the concept of statistical sampling by graphing the results of a questionnaire the students had completed and relating procedures to work found in textbooks.
- a volunteer led a fifth grade class in the dissection of a fish. They compared the fish anatomy to their own.

Many positive experiences were reported. However, lack of sufficient planning time was a problem for a few teams. Next year DuPont Merck coordinators hope to expand the program by having volunteers "teach" the successful lessons/units to other volunteers so they, in turn, can use them in the classroom. In

addition, it is hoped that teachers will now be able to teach the lessons which were primarily developed and taught by the volunteers.

Mentoring Project The mentoring project was established to provide mentors for students who demonstrate a particular ability and interest in science and for those who have ability but may not be using it to full potential. Two Warner teachers helped set up the project. During the fall semester, 14 volunteers worked with a student each to develop and conduct an experiment. Their results were displayed at a poster session at the conclusion of a DuPont Merck tour and lunch for the students' parents. Evaluation of the first semester's mentoring indicated that volunteers needed to be willing to commit enough time to complete a project and that the projects should be more closely connected to classroom lessons.

Let's Visit A Research Lab Volunteers are currently developing a series of assembly programs for the fifth grade based on a the program "Let's Visit A Research Lab" produced by the Department of Health and Human Services. They are working on the careers in science module -- planning posters and speakers -- and hope to begin this spring.

And More The volunteers often provide equipment for the activities taught. There is also an equipment resource team which looks out for equipment being phased out by the company which could be used by the school. In addition, DuPont Merck may set up a grant program so that the school can receive needed materials.

In February, Black History month, DuPont Merck brought to the school assembly a rap program by an African-American scientist.

The DuPont Merck coordinator, Tish Cheatham, summed up the partnership by saying that Warner now seemed like "a second home"

to her and many of the volunteers who spent a good deal of time there. She thought that some Warner teachers might feel the same way about DuPont Merck.

When asked to give advice to any company thinking about adopting a school, she recommended it as a rewarding project but added the caveat, "Don't try to take on everything at once... gradually develop programs with the school."

APPENDIX

EVALUATION FORMS

TEACHER/VOLUNTEER PARTNERSHIP PROGRAM
Science, Math and Technology

STUDENT EVALUATION
(Pre)

Boy_____ Girl_____

1. What do scientists do?

_____

_____

_____

What do engineers do?

_____

_____

_____

2. What do you think is the most important part of science?

_____

_____

_____

3. Are you a scientists?

yes_____ No_____

4. What kind of people use science?

_____

_____

_____

5. Draw pictures of scientists on the back.

6/92

TEACHER/VOLUNTEER PARTNERSHIP PROJECT
Science, Math and Technology

TEACHER PRE-ASSESSMENT

SECTION I

Name _____

Name of School _____

Grade _____

Date _____

SECTION II

Please answer the following question a briefly and honestly as possible.

1. What are the objectives of your Teacher/Volunteer Partnership?

_____

_____

_____

2. Science in my classroom include:

	(circle one)			
texts	Always	Frequently	Occasionally	Never
lecture	Always	Frequently	Occasionally	Never
demonstration	Always	Frequently	Occasionally	Never
supplemental reading	Always	Frequently	Occasionally	Never
hands-on	Always	Frequently	Occasionally	Never
integration with other subject	Always	Frequently	Occasionally	Never
field trips	Always	Frequently	Occasionally	Never
outside resources	Always	Frequently	Occasionally	Never
guest	Always	Frequently	Occasionally	Never
discussion	Always	Frequently	Occasionally	Never
journal writing	Always	Frequently	Occasionally	Never
small groups	Always	Frequently	Occasionally	Never
other (please explain)	Always	Frequently	Occasionally	Never

_____

Teacher Pre-assessment (cont.)

4. How do you expect this project to affect the children's attitudes and understanding?

_____

_____

_____

TEACHER/VOLUNTEER PARTNERSHIP PROJECT
Science, Math and Technology

TEACHER EVALUATION

Please give us you input by evaluating the Teacher/Scientist Partnership from your perspective. Please include comments or ideas that you feel might be helpful in making plans for the new year. This information is necessary to complete our records and important to program development. Thank You!

SECTION I

Name _____

Name of School _____

Grade _____

Distribution of Students:

Male_____ Female_____ Afro-American_____ Hispanic_____
Caucasian_____ Native American_____ Asian/Pacific_____

Type of partnership (Check all that apply)

___Developing and/or co-teaching lessons
___Breakfast with a Scientist
___Resource
___Other - Please explain _____

SECTION II

Please answer the following question a briefly and honestly as possible.

1. Science in my classroom include:

	(Circle one)			
texts	Always	Frequently	Occasionally	Never
lecture	Always	Frequently	Occasionally	Never
demonstration	Always	Frequently	Occasionally	Never
supplemental reading	Always	Frequently	Occasionally	Never
hands-on	Always	Frequently	Occasionally	Never
integration with other subject	Always	Frequently	Occasionally	Never
field trips	Always	Frequently	Occasionally	Never
outside resources	Always	Frequently	Occasionally	Never
guest	Always	Frequently	Occasionally	Never
discussion	Always	Frequently	Occasionally	Never
journal writing	Always	Frequently	Occasionally	Never
small groups	Always	Frequently	Occasionally	Never
other (please explain)	Always	Frequently	Occasionally	Never

2. How were the objectives of the partnership achieved?

_____

_____

_____

3. What changes in attitudes or conceptions have you observed in the children?

_____

_____

_____

4. Which aspects of the project would you change or improve?

_____

_____

_____

6. Are you willing to participate in the project next year?

yes_____ no _____

SECTION III

Please use the following scale and circle the appropriate number beside each statement.

5 = Strongly Agree 4 = Agree 3 = No Opinion 2 = Disagree 1 = Strongly Disagree

5 4 3 2 1 The first meeting at the school was well organized and helpful in setting up the partnership.

Comments_____

_____

5 4 3 2 1 The volunteer communicated his/her ideas at an appropriate level?

Comments_____

_____

5 4 3 2 1 In my opinion, the students benefited and learned from this experience.

Comments_____

_____

TEACHER/VOLUNTEER PARTNERSHIP PROJECT
Science, Math and Technology

EVENT REPORT - TEACHER

Please complete a report each time a volunteer comes to you class.

Name:

School:

Grade:

Number of Students:

Date of Activity:

Volunteers Name:

Brief Description of Activity:

What preparations were necessary for this visit? (i.e. facilities, scheduling, academic)

Comments:

TEACHER/VOLUNTEER PARTNERSHIP REPORT
Science, Math and Technology

EVENT REPORT - VOLUNTEER

Please complete a report each time you go into the classroom.

Name:

School:

Teacher's Name:

Grade Level:

Date of Activity:

Description of Activity:

Comments:

ELEMENTARY PARTNERSHIP PROJECT

VOLUNTEER EVALUATION

Please give us you input by evaluating the Teacher/Scientist Partnership from your perspective. Please include comments or ideas that you feel might be helpful in making plans for the new year. This information is necessary to complete our records and important to program development. Thank You!

SECTION I

Name _____

Organization _____

Name of School _____

Number of times you went into the school _____

Type of partnership (Check all that apply)

___Developing and/or co-teaching lessons
___Breakfast with a Scientist
___Resource
___Other - Please explain _____

Did you attend a Partnership Orientation Training Session? ___yes___no
Date _____ Where _____

SECTION II

Please use the following scale and circle the appropriate number beside each statement.

5 = Strongly Agree 4 = Agree 3 = No Opinion 2 = Disagree 1 = Strongly Disagree

5 4 3 2 1 The training session was helpful and addressed my questions about the partnership program.

Comments _____

_____

5 4 3 2 1 The first meeting at the school was well organized and helpful in setting up the partnership.

Comments _____

_____

5 4 3 2 1 The teacher participated in the classroom activities.

Comments _____

_____

5 4 3 2 1 The teacher shared classroom management responsibilities.

_____

_____

5 4 3 2 1 The students were prepared for this experience and cooperative.

Comments_____

5 4 3 2 1 In my opinion, the students benefited and learned from this experience.

Comments_____

SECTION III

Please answer the following question a briefly and honestly as possible.

1. What was the most helpful aspect of the Partnership Orientation Training Session?

2. What were the stated objectives of your partnership and were they achieved?

3. Which aspects of the project would you change or improve?

4. Did you find the Science Alliance to be helpful when called upon for information or help?

5. Are you willing to participate in the project next year?

   yes_____ no _____

6. If the answer to the question above is yes, do you wish to remain in the same school?

   yes_____ no_____

7. If no, will you explain why?

APPENDIX

"CHALLENGES"

Challenges	Partial Solutions	Suggestions
Selecting appropriate schools	EACH YEAR	
(principal unsupportive; teachers too busy;		
liaison too busy)	*find schools where there are several interested	
	teachers	
	*make sure to have principal's support in writing	
	*get the help of an enthusiastic, willing liaison	
	teacher	
Recruit volunteers		
("downsizing" of industry decreases pool and	*use volunteer database	
causes volunteers to be busier; some find	*use e-mail in industries	
they are not comfortable with elementary	*"advertise" in professional newsletters	
classes)	*"advertise" in local newspapers	
	*encourage volunteers to recruit colleagues	
	*display recruitment posters in industry, senior	
	citizen academies, etc.	
	**recruit parents by letter	
Communication/Coordination		
(contacting teachers and volunteers; getting	*appoint coordinator for school	
them together; finding out what is	*have teachers complete forms showing when &	
happening)	what help they need; how & when to reach	
	*have volunteers complete forms explaining	
	how they can help; how to contact	
	*have teachers & volunteers meet at beginning	
	of school year; coordinator faciltate	
	meeting, make suggestions for getting	
	started and make sure contacts are made	
	before meeting ends	
	*develop packet for teacher & volunteer with	
	info described above plus safety tips, school	
	plan, etc.	

Challenges	Partial Solutions	Suggestions
Orientation/Training of Volunteers		
(determining best time and length of time to meet; finding appropriate video excerpts)	*meet for 2 1/2 hrs in evening and include:	
	1. overview of program and how volunteers can help	
	2. what's new in science ed (constructivism) with classroom video to show children's ideas and activities to address alternative conceptions (use video excerpt which shows good teaching, but not so "masterful" volunteers feel they could not do)	
	3. have experienced volunteer demonstrate presentation--who can be a scientist, what do scientists do (include hands-on activity)	
	4. have coordinators and/or liaison teachers meet with volunteers from their schools to set up contacts.	
	5. have volunteers complete evaluation forms to determine: whether expectations were met; what they found useful; their suggestions; and best time to schedule such sessions	
Teamwork in Classrooms		
(is collaborative planning and teaching really going on)	Proposals:	
	*training sessions with teams [volunteer & teacher(s)] working together using, perhaps, kit curricula	
	*(see evaluation for more suggestions)	

Challenges	Partial Solutions	Suggestions
Evaluation		
Program:		
(what to evaluate; how to evaluate; finding	*feedback forms for teachers & volunteers	
people with time & ability)	*pre/post assessment for teacher and volunteers	
	*coordinators contact teachers and volunteers	
Children:	*pre/post assessment for children	
(what to assess about what children gain from		
partnerships: young children's lack of		
writing &drawing skills; inconsistent		
administration of assessment)		
(difficulty collecting forms from all		
participants)		
	PROPOSED	
	*coordinator "interviews" teachers, volunteers,	
	and children	
	*NEEDED: full-time evaluation person	